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ABSTRACT

Science faculty at small community colleges often face the problem of teaching courses at off-campus locations without laboratory facilities or equipment. An introductory physical science course offered at Southampton Correctional Center in Capron, Virginia, illustrates one approach to this problem. First, the instructor met with students prior to the course, surveyed their interests, and made a list of topics from various science disciplines, including "Why We Need to Understand Science," "What Is Life?" "DNA, Genes, and Genetics," "The Origin of Species," "Measuring the Unmeasurable," "The Earth," "Ecology," "Energy," "Cosmology," and "The Solar System." In the lecture part of the course, students were introduced to scientific thinking and the roles that intuition, inductive and deductive reasoning, and models play in this process. Because of the diversity of topics covered, copied handouts were used rather than a single textbook. The laboratory requirements of the class were fulfilled by having students view 32 hours of videotapes on the topics covered in lectures and handouts and write papers on 10 of the tapes. Students were instructed to evaluate the tapes in terms of the point of view and biases of the presenter, whether the content was based on scientific evidence, and how successful the presentation was. Excellent student papers and exam performance, lively discussions, and positive student comments provided evidence that the course's objectives were met. (VVC)

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by Joseph Payez

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A NON-TRADITIONAL NATURAL SCIENCE COURSE FOR OFF CAMPUS LOCATIONS

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A problem which science faculty at a small community college often face is how to teach a science course at an off-campus location which has no laboratory facilities or equipment and still be able to fulfill the laboratory requirement of the course. Usually some effort is made to carry in a few pieces of equipment and have the students perform some makeshift experiment; but by and large, such an approach is unsatisfactory for good student learning and usually results in damaged equipment. Traditional lecture/lab classes just do not work well in this kind of teaching situation.

During the past year, I was presented with this problem as I was assigned to teach NAS 111-112, Physical Science I-II, to twenty inmates at the Southampton Correctional Center at Capron, VA. The class was scheduled to meet six hours per week in a large lecture hall which had no lab facilities. According to the Virginia state curriculum guide, this course sequence is designed for non-science majors. Topics from various science disciplines are treated selectively, showing how they fit in the structure of physical science, from the cosmic to the subatomic. In this class, the inherent uncertainty of knowledge and the operational philosophy are to be emphasized.

Since there were so many possible topics which could be chosen for this course, I decided to let student interest and input, as well as availability of appropriate materials, determine which topics would be

covered in the course. I met with the students prior to the course, surveyed their interests, and made a list of possible contemporary topics. The topics were developed into a two semester course outline. The topics decided upon were as follow:

<u>True Science</u>

-Why We Need to Understand Science
-Science Methodology
-Hypothesis, Theories, and Laws
-The Importance of Models
-The Relationship Between Science and Religion
-Discarded or Modified Theories

<u>What is Life?</u>

-Living vs. Nonliving
-Inside the Cell
-Classification of Life Forms?
-Diseases
-Immune Systems

<u>DNA, Genes, and Genetics</u>

-Watson-Crick Model of DNA
-What are Genes
-Meiosis and Mitosis
-Heredity
-Genetic Engineering
-Selective Breeding`
-Cancer
-Aging Process

<u>The Origin of Species</u>

-Evolution vs. Creation: Primary Models
-The Species Change
-Voyage of the Overloaded Ark
-Adapting Darwinism to Latest Advances

<u>Measuring the Unmeasurable</u>

-Age of the Earth, Rocks, and Fossils: Dating Methods
-Speed of Light
-Circumference of Earth
-Mass of the Stars and Planets
-Distance to the Stars and Planets

The Earth

-Chronology of Earth
-Fossil Record
-Geological Column
-Was There A Great Flood?
-Drifting Continents

Ecology

-Open or Closed Ecological Systems
-Studying Ecosystems
-What Are We Doing to Mother Earth?
-Greenhouse Effect
-Ozone Layer
-Is There A Population Explosion?
-Earth's Natural Resources

Energy

-What is Energy
-Alternate Energy Forms
-Fission and Fusion
-Cold Fusion
-The Future of Our Energy Sources

Cosnology

-The Beginning and End of Time
-Big Bang Model, Oscillating Universe Model, Creation Model
-The Beginning of the Universe
-Stars and Heavenly Bodies

The Solar System

-Astronomy: The Solar System
-What We Know About Each Planet?
-Formation of the Planets
-Extraterrestrial Life?
-Armagedon

In the lecture part of the course, the students were introduced to scientific thinking and the part that intuition, inductive reasoning, deductive reasoning, and models play in this process. They learned about the role that models play in the viewing of how nature functions and how the particular model influences the scientist's point of view. The students also learned what constitutes a law, a theory, a hypothesis, and an idea.

Because of the nature of the course and the diversity of the topics covered, no single textbook was sufficient. Instead, xeroxed handouts from several source books, journals, newspapers, magazines, etc., served as reading material for the course. Even though most of these were provided by the instructor, students also provided materials which served as valuable additions to the course. The various topics were reinforced by short lectures, demonstrations and ample discussion. The students were introduced to the method of (unbiased?) scientific reasoning and were required to use it to analyze orally and in writing the presentations of the authors, as well as the instructor's lectures, on he contemporary topics in science.

The laboratory requirements of the course were fulfilled by having the student view thirty-two hours of videotapes on the topics covered in lecture and the handouts and by writing papers on ten of the tapes. The students were encouraged to seek outside materials, as well as using the handouts to do their papers. The students examined the point of view of each presenter and tried to evaluate whether what was presented was based on scientific evidence, tried to determine any biases the presenter may have had in his presentation, and discussed how successful they thought the presentation was. They were also given pop quizzes on the video tapes. The only equipment required was a VCR, a television, and the videotapes, some of which were rented and some of which the college already owned. The major goals that I set for the course were as follows:

1. Provide non-science students with an adequate science course for transfer to four-year institutions.

2. Convey to the student a small portion of the meaning, scope, and the excitement of physical science as a significant perspective from which to view the world.
3. Provide each student with an understanding of basic scientific terminology so that he can read and understand scientific articles in newspapers and magazines, as well as understanding scientifically oriented TV programs and films.
4. Provide the student with an understanding of the scientific method of thinking so that he can better analyze and evaluate whether something being presented is based on scientific evidence or whether it might be biased by the presenter's viewpoint.
5. Provide the students with a basic understanding and knowledge of principles from each of several physical science areas.

Based upon the excellent student papers which I received, the scores on the students' exams and on the tremendous student input and interest shown during the classroom discussion, I feel certain that these goals were accomplished.

The student comments, which were taken directly from course evaluations, verify this--as virtually every student comment received was very positive. 80% of the students who took the class evaluated it as excellent while 20% evaluated it as very good. In fact, the reaction to the course was so favorable that it is being done this year at a different annex of the correctional center.

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